# APPENDIX B

# SUSTAINABLE DESIGN FOR MILITARY FACILITIES

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1. Background

a. On June 3, 1999 Executive Order (E.O.) 13123, “Greening the Government Through Efficient Energy Management” was signed. This E.O. establishes goals for greenhouse Gases (GHG) reduction, energy efficiency improvement, industrial and laboratory facilities, renewable energy, petroleum, source energy, and water conservation. E.O. 13123, Part 2 – GOALS, lists seven goals for facilities. Six of the seven specifically emphasize that “life-cycle cost-effective” means are to be used to comply with these goals. The E.O. specifically states that: “agencies shall apply such principles to the siting, design, and construction of new facilities. Agencies shall optimize life-cycle costs, pollution, and other environmental and energy costs associated with the construction, life-cycle operation, and decommissioning of the facility.” This emphasis on life-cycle cost effectiveness may, in many occasions, make it more difficult to achieve goals established by this E.O.. E.O.’s 12902, 12845 and 12795 are revoked by E.O. 13123.

b. On August 6, 1993 Executive Order (EO) 12873, "Federal Acquisition, Recycling, and Waste Prevention," was signed. Section 401 of this E.O. states that "In developing plans, drawings, work statements, specifications, or other product descriptions, agencies shall consider the following factors: elimination of virgin material requirements; use of recovered materials; reuse of product; life cycle cost; recyclability; use of environmentally preferable products; waste prevention (including toxicity reduction or elimination); and ultimate disposal, as appropriate." The EO also directed the Environmental Protection Agency (EPA) develop guidance to help federal agencies incorporate environmental preferability into their purchasing procedures.

c. In response to EO 12873, EPA developed Comprehensive Procurement Guidelines (CPG I and II). These are the first formal regulations implementing sustainability requirements. The companion Recovered Materials Advisory Notices (RMAN I and II) contain EPA's recommendations for purchasing all items designated in the final CPGs. Currently, EPA has designated 36 items that are, or can be, manufactured using recycled and recovered materials. Construction, landscape, park and recreation products are among the designated items. Federal Agencies are required to purchase EPA-designated items meeting minimum recycled-content standards unless they are not available within a reasonable period of time; fail to meet reasonable specification standards; are not available from two or more sources (to maintain competition); or are unreasonably priced (5% higher than comparable non-recycled products). Recycled-content purchase requirements are discussed in EPA's "Federal Recycling Guide for Waste Prevention, Recycling and Buying Recycled."

2. Definition

a. Sustainable Design (Green Building) is the design, construction, operation, and reuse/removal of the built environment (infrastructure as well as buildings) in an environmentally and energy efficient manner. Sustainable Design is meeting the needs of today without compromising the ability of future generations to meet their needs. Sustainable Design includes not only efficient use of natural resources, but it can also translate into better performance, desirability, and affordability.

b. Sustainable Design incorporates the energy concerns of the 1970's with new concerns in the 1990's, including damage to the natural environment; emissions of greenhouse gases and ozone depleting chemicals; use of limited material resources; management of water as a limited resource; reductions in waste; indoor environmental quality; and occupant/worker health, productivity and satisfaction. Ideally, we would only use resources in the built environment at the speed at which they naturally regenerate, and discard them at or below the rate at which they could be absorbed by natural ecological systems.

c. While the ideal may not be achievable at present, those involved in designing, constructing, operating, maintaining, and retiring the components of the built environment, such as the U.S. Army Corps of Engineers (USACE), can take steps now to maximize energy efficiency and minimize environmental impact. Green Building goes beyond simple green products and recycled materials. Green Building is an environmental consciousness or resource awareness about using or not using our valuable natural resources in an energy-conscious or conservative way. This is an important concept. It is an attitude about applying sound design principles and practices to create a built environment, which optimizes the functionality and operability of the total system while incorporating sustainable design principals.

3. Goals and Objectives of Sustainable Design

a. The overall USACE goal of Sustainable Design is to be environmentally responsible in the delivery of facilities. The key traditional elements for decision making in the facility delivery process are cost, quality and time. These elements need to be expanded to include the ecological and human health impacts of all decisions.

b. Each project generates its own set of goals. However, sustainable design goals should apply to all projects. The goals for improving the environmental performance of facilities include: (a) use resources efficiently and minimize raw material resource consumption, including energy, water, land and materials, both during the construction process and throughout the life of the facility, (b) maximize resource reuse, while maintaining financial stewardship, (c) move away from fossil fuels towards renewable energy sources, (d) create a healthy and productive work environment for all who use the facility, (e) build facilities of long-term value, and (f) protect and, where appropriate, restore the natural environment.

c. Identify environmental goals and requirements from paragraph 3A and 3B above to be implemented during the design process, and include them in the project development document. Integrate into the project planning and goal setting process applicable requirements from the installation Pollution Prevention (P2) Program. Make decisions during the planning and design process to support installation-wide reduction in the release of ozone depleting chemicals (ODC) and greenhouse gases; reduction in the use of hazardous materials and pesticides, and the generation of solid wastes; and support the EPA 33/50 Program (a voluntary program targeting 17 chemicals for reduction).

d. Where possible, budget for environmental and energy-efficient equipment, systems, and design solutions based on life cycle cost assessment (LCCA). Consider potential for cost-effective use of photovoltaics, on-site wastewater treatment, and graywater systems. Generally the potential for these is greatest in remote areas. Where those technologies show promise, include as special requirements in the project description, and budget accordingly.

e. While developing the DD1391, identify funding sources for sustainable features that cannot be addressed within the Programmed Amount (PA). Also identify, by line item, resources required for desired level of Systems Commissioning and for the preparation of O&M Manuals.

4. Project Design Team

a. Only through an interdisciplinary approach can true sustainability be achieved. Technical Manual 5-803-14, Site Planning and Design, describes the design team. Guidelines set forth in the AEI on Installation Support should be followed in establishing the design team. The makeup of the team will be determined by the particular type of project, but members must achieve a common understanding of environmental and energy conservation concerns. All members of the design team should participate in initial goal setting and should also attend the design charette.

b. Set clear and specific environmental and energy conservation goals for the project. Quantify goals wherever possible; for example, energy use, water use, allowable levels of volatile organic compounds (VOC) emissions, etc. The Environmental members of the design team shall educate the entire team about opportunities for incorporating sustainable design.

c. Consideration of many more system options will require extensive training, criteria, policy, additional computer modeling software, and additional experience to enable the selection of the most Life-Cycle Cost Effective solutions. Building Commissioning will be necessary to initiate proper operation of these more complex systems. Facilities will require the installation, periodic calibration, maintenance, and repair of additional meters.

5. Planning and Site Selection

a. Use the procedures described in Technical Manual 5-803-14, Site Planning and Design, to analyze the site. In addition, when planning and selecting a site, the following should be considered to minimize environmental impacts: (a) renovate and reuse existing buildings, where possible, (b) leave pristine areas untouched and minimize disturbance to wildlife habitats, (c) give priority to and build on previously disturbed or damaged sites, and, where possible, restore damaged areas, (d) minimize transportation requirements for the transport of goods and services and for employee, occupant, or customer commuting, (e) maximize existing transportation links, especially public transit, and minimize the need to build new links, and (f) maximize cluster development strategies to reduce disturbance of open areas and reduce utility and transportation costs.

b. Review the established Installation Master Plan, Installation Design Guide, general planning guidelines, or sub-installation area development plans to ensure an optimal coordinated site selection, as described in Technical Manual 5-803-14. Rank alternate sites for the proposed project based upon a comparative analysis of the issues. Consider the potential environmental impacts the proposed improvements will have on the surrounding environment, neighboring communities and cultural resources. Review the Environmental Impact Statement (EIS), and pay particular attention to impacts of decreased water quality, increased storm water runoff, increased erosion potential and ambient air quality. Ensure compliance with the National Environmental Policy Act (NEPA). Consider the reuse or rehabilitation of an existing previously developed site rather than altering undisturbed raw land, if an existing base is not to be utilized for the proposed improvements. Consider the location of the proposed site in relation to existing facilities to minimize transportation requirements and to provide opportunities for shared use of common areas wherever possible. Understand the micro-climate of each site and identify which sites have the best potential for sustainable design based on temperature, humidity, wind and solar orientation. Consider each site's potential for producing alternative forms of electricity. For example, remote guard shacks may be good candidates for the use of photovoltaics. Consider the vegetation and topography of each site and identify which site would require the least amount of disruption in order to accommodate the proposed improvements. Consider the geology and hydrology of each site and identify which sites are most suitable for the proposed improvements. Avoid development of sites that would adversely affect watersheds. Consider any potential for cleanup (Installation Restoration Program) requirements for the site. Understand the ecology of the site in order to identify natural habitats that may be endangered through its development, and select a site on which the proposed improvements can be developed in a manner that maintains the existing ecological balance.

6. Site Development

a. The project site should be developed as described in Technical Manual 5-803-14 and within the following guidelines to ensure minimum environmental disturbance: (a) protect site natural resources, such as water, soil, vegetation, natural amenities, etc., (b) place infrastructure and buildings on the site (cluster buildings, where possible) to minimize disturbance, preserve open space and environmentally sensitive areas, and to make beneficial use of renewable resources (sun, wind, rain, snow, etc.)., and (c) maximize the use of existing site conditions such as: natural drainage patterns, natural vegetation and soils, clean air, etc.

b. A complete site survey and soils report should be produced as described in Technical Manual 5-803-14. Include watersheds, drainage areas, stream corridors, wetlands, aquifer recharge zones, hundred year flood plains, special vegetative areas, and a tree survey (include location, genus and species) of all trees sized 15 cm DBH (diameter breast height) or greater. Identify locations of any special cultural or archaeological sites. Document all information on site analysis drawings. Test site radon levels if the region has potential for radon contamination. Develop a plant list to be used during the design process that identifies acceptable native plants and other plants that are suitable for use on the site based upon existing climate, soils and ecology and pest and disease considerations, as described in Technical Manual 5-803-13, Landscape Design and Planting.

7. Sustainable Design and Construction of the Built Environment

Design and construction of sustainable buildings should be in accordance with the following concepts:

a. Strategic Facility Planning and Programming--Analysis to determine whether to renovate or build new, sell existing facilities or lease, consolidate or decentralize, is critical to ensuring long-term viability, resource conservation and life-cycle cost benefits;

b. Site Work and Planning--Environmentally sensitive planning looks beyond the boundary of the project site to evaluate linkages to transportation and infrastructure, ecosystems and wildlife habitat and community identification. Site planning evaluates solar and wind orientation, local microclimate, drainage patterns, utilities and existing site features to develop optimal siting and appropriate low maintenance landscape plant material;

c. Building Layout and Design--Optimize building size, and maintain an appropriate building scale for the environment and context of the building or a building component. Layout the rooms of a building for energy performance and comfort, and design for standard sizes to minimize material waste. Pay careful attention to the location of exterior windows. Avoid structural over-design and the resultant waste. Design components of the built environment for durability and ease of adaptation to other uses, and for waste recycling.

d. Energy--Building orientation and massing, natural ventilation, day-lighting, shading and other passive strategies, can all lower a building's energy demand and increase the quality of the interior environment and the comfort and productivity of occupants. The efficiency of required systems is maximized through use of advanced computer modeling and life cycle cost analysis;

e. Building Materials--Environmentally preferable building materials are durable and low maintenance. Within the parameters of performance, cost, aesthetics and availability, careful selection and specification can limit impacts on the environment and occupant health;

f. Indoor Air Quality--Indoor air quality is most effectively controlled through close coordination of architecture, interiors and MEP design strategies that limit sources of contamination before they enter the building. Construction procedures for IAQ and post-occupancy user guides also contribute to good long-term IAQ;

g. Water--Site design strategies that maximize natural filtration of rainwater and consideration of on-site biological treatment systems for building gray water and waste water can enhance water quality. Water conservation is enhanced by low flow plumbing fixtures, water appropriate landscaping and HVAC and plumbing system design;

h. Recycling and Waste Management--Waste and inefficiency can be limited during construction by sorting and recycling demolition and construction waste, reuse of on-site materials and monitoring of material use and packaging. Accommodating recycling into building design reduces waste while generating revenues;

i. Building Commissioning, Operations and Management--Effective building commissioning is essential to ensure proper and efficient functioning of systems. Facilities operations benefit from the monitoring of indoor air quality and energy and water saving practices, waste reduction and environmentally sensitive maintenance and procurement policies; and

j. Strategic Environmental Management--By integrating long-range environmental considerations into their proactive planning process, manufacturing-based organizations (such as AMC) can eliminate emitted or discharged pollutants. Strategic environmental management helps to understand and assess environmental risks and opportunities so users can make informed decisions about their facilities and processes.

k. Construction Contracts—Administration of construction contracts with new incentive clauses and complex shop drawings will require additional training, experience, resources and acquisition strategies.

8. Maximizing User Health and Productivity

a. In order to maximize the health and productivity of inhabitants and users of sustainable projects, the following guidelines should be followed to the maximum extent practicable:

(1.) Pay particular attention to indoor air quality, i.e., minimize radon entry, exposure to electromagnetic fields, pesticides, products that release formaldehyde and volatile organic compounds, and other "sick building" factors, and

(2.) Provide adequate, efficient lighting, and where possible, incorporate into design of a building: day lighting, natural ventilation, views, greenery and other indoor environmental amenities.

(3.) Provide effective air distribution patterns and ensure that temperature and humidity comply with existing Corps criteria.

b. Use existing Corps criteria as well as ASHRAE Standard 62-1989, Ventilation for Acceptable Indoor Air Quality, as a design guideline. Document IAQ related site characteristics. In urban, industrial or other areas with possible air quality problems, test ambient air quality on-site. Typical facility-related air pollutant emissions sources to be addressed include aircraft operations, motor vehicles, energy generators and boilers, incinerators, industrial processes (such as plating, spray-painting and abrasive blasting), volatile fuels and solvents, jet and rocket engine test facilities, asphalt/concrete plants, wastewater treatment facilities and bakeries and laundries. Determine air filtration requirements and ensure that the requirements of CEGS 15895, Air Supply and Distribution System, are met. Consider air filter alarms to notify building maintenance personnel so that excessive static pressure does not develop and compromise efficiency. Determine fresh air rates based on ASHRAE Standard 62-1989 and other Corps criteria. Do not underestimate occupant densities. Consider programmed number of occupants plus visitors and plan for possible future requirements.

9. Designing for Energy Efficient Operation

a. Sustainable design requires the use of energy efficient equipment and systems, such as the following:

(1.) Use high levels of insulation, tight construction, high-performance windows (superior insulating value), and glazing with low solar heat gain (in appropriate climates).

(2.) Make use of renewable energy sources, i.e., passive solar heating, natural cooling or ventilation, day-lighting, photovoltaic electricity production, etc, where life cycle cost effective.

(3.) Use energy conserving mechanical and electrical equipment and their accessories, as well as lighting, that meets or exceeds existing Corps criteria. Investigate the use of cleaner fuels such as natural gas and cogeneration where remote government owned power plants are available.

b. Ensure that the design methodology and other energy conservation criteria of Chapter 11, Architectural and Engineering Instructions--Design Criteria, are followed or exceeded, including the selection of equipment and systems based on life cycle cost and compliance with energy use budgets. Consider the use of low energy consuming systems such as geothermal heat pumps, desiccant cooling and thermal storage, as well as equipment that exceeds the minimum energy efficiencies contained in the CEGS and other Corps criteria.

c. Gather information on the climate including temperature, humidity, insulation, wind, precipitation and other weather anomalies. Identify aspects of the micro-climate that create opportunities for energy conservation such as solar orientation for passive and/or active solar strategies, and topography or vegetation for shade and windbreaks. Explore energy sources available at the site. Identify opportunities for the cost-effective use of alternative energy resources such as photovoltaic panels, wind, biofuels and geothermal. Review utility rate structures and identify demand charges. Evaluate potential for utility rebates. Investigate building usage patterns and occupant loading rates for optimum conditions.

d. Determine lighting levels for all programmed areas based on Illumination Engineering Society (IES) recommendations. Consider lighting strategy when determining foot-candle levels (e.g., uplighting, downlighting, etc.). When task lighting is anticipated, reduce ambient lighting levels accordingly. Determine plug loads for energy modeling purposes based on the probable usage. Consider difference between energy surge during equipment start up and actual energy usage of equipment, and factor in diversity to reflect actual number of equipment users at any given time. Plug loads are commonly overestimated. Require office equipment and appliances to meet the requirements of the EPA Energy Star program.

10. Management of Water as A Limited Resource

a. Water is one of our most important life sustaining resources; with potable water being critical in much of the U.S. Sustainable Design requires careful consideration of the following: (a) utilize xeriscape design principles, and water-efficient, low-maintenance, native landscape materials, (b) utilize water-efficient plumbing fixtures, (c) design for the reuse of rainwater and "graywater" (water from showers, sinks, and washing machines) where permitted, and (d) recycle sewage treatment plant sludge or minimize the environmental impact of its disposal.

b. The designer must evaluate the possibility of eliminating permanent irrigation systems through the use of plant materials that are appropriate for the site's climate and soils as described in TM 5-803-13. If plant materials with supplemental water requirements are desired, limit their use to a defined area and utilize efficient drip irrigation systems. The designer should evaluate potential for rainwater retention or graywater recycling as described in TM 5-803-14. Analysis using LCCA is required if systems were identified during the planning phase. Ideal applications are regions with limited water availability and where some landscape irrigation is desirable.

c. Since graywater reclamation and wastewater treatment facilities require regulatory authority approval, initiate the permitting process as soon as the requirement is known. Identify the personnel who will operate and maintain the treatment system and obtain their input before selecting a system. Evaluate potential for cost-effective mechanical or biological on-site wastewater treatment of wastewater or runoff from paved areas. Analysis using LCCA is required if these systems were identified during the Planning Phase. Ideal applications for wastewater include facilities with high water use requirements and localities where water treatment is limited and/or costly. Ensure that facility siting is in accordance with the wellhead protection plan of the installation. Develop water-conserving criteria for plumbing fixtures.

d. At a minimum, the designer must use low-flow fixtures as described in CEGS 15400, Plumbing, General Purpose, and CEGS 15405, Plumbing, Hospital. Evaluate requirements for National Pollution Discharge Elimination System (NPDES) permitting, resulting from facility operations or construction. Facilities and surrounding area should minimize potential for storm water runoff and resulting erosion.

11. Resource-Efficient Materials In Design and Construction

a. The designer must incorporate Sustainable Design by investigating the following:

(1.) Consider the total life-cycle costs and environmental impact of products and materials rather than just their initial price. Use durable products and materials. Select materials with low embodied energy.

(2.) Avoid environmentally harmful materials, i.e., those containing ozone-depleting chemicals or releasing gaseous pollutants, toxins, etc. Also avoid utilizing excessive packaging, where possible.

(3.) Buy locally produced materials to minimize the impact of transporting them.

(4.) Reuse salvaged materials, or use products made from recycled materials. Select materials that can be recycled at the end of their use.

(5.) Use integrated pest management practices to reduce the use of pesticides that may present a hazard to humans and the environment. In selecting pest management, preference should be given to practices that minimize or eliminate the need for chemical applications.

b. Designers will specify a preference for recycled-content building materials in accordance with EPA Guidelines. Designers should identify locally manufactured building materials and products, and create list of manufacturers/suppliers for the design team. This process will streamline materials research during design, and will enhance early consideration of locally manufactured types of products. This process will not be used to limit competition during bidding. As an exception, the designer of historic building renovations will identify building materials for renovation, etc. These materials are subject to the Secretary of Interior Standards.

12. Green Building Rating System: Sustainable Project Rating Tool (SPiRiT)

a. SPiRiT is a USACE developed rating tool that resulted from the Army Chief of Staff for Installation Management (ACSIM) memo, 1 May 2000 decreeing that all future facilities be designed and built according to sustainable principles as well as requesting USACE to provide technical guidance to support this initiative. USACE has a licensed agreement with the US Green Building Council permitting us to use its name Leadership in Energy and Environmental Design (LEED) as part of SPiRiT. The LEED Green Building Rating System is a proprietary program of the US Green Building Council. With the use of SPiRiT we will ensure that Sustainable Design and Development is considered in Army installation planning decisions and infrastructure projects to the fullest extent possible, balanced with funding constraints and customer requirements. Based on existing proven technology it evaluates environmental performance from a "whole building" perspective over a building's life cycle, providing a definitive standard for what constitutes a "green building". As a minimum we shall use SPiRiT to score our design and strive to meet the SPiRiT Bronze certification level. When the recommended Bronze level is not achieved, the District Project Delivery Team's Project Manager will report the issue to the MSC Program Manager and to the PM at HQUSACE with an explanation as to why this level can not be achieved. The HQUSACE PM will forward this information to Engineering Team of Technical Policy Branch, Engineering and Construction Division.

b. SPiRiT is based on accepted energy and environmental principles and strikes a balance between known effective practices and emerging concepts. Unlike other rating systems currently in existence, the development of SPiRiT uses applicable, equivalent military standards and regulations, where applicable.

c. SPiRiT is a self-evaluation system designed for the design agent and the owner to rate new and existing facilities. It is a feature-oriented system where credits are earned for satisfying each criteria. Different levels of SPiRiT certification levels are awarded based on the total credits earned. The system is designed to be comprehensive in scope, yet simple in operation.

d. For classification as a Green building, facilities must satisfy all of the prerequisites and a certain number of credits to attain different SPiRiT certification levels. Having satisfied the basic prerequisites of the rating tool, facilities are then rated according to its degree of compliance (on a percentage basis) with the credit system listed below.

e. SPiRiT is divided into eight categories: sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality facility delivery process, current missions, and future missions. The following is a synopsis of SPiRiT.

**Sustainable Sites (Score 20)** SPiRiT minimizes the impact of placing a building on a site, with an eye to land use compatibility and biodiversity. It channels development to installation areas with existing infrastructure, rehabilitates damaged sites, and reduces impacts from automobile use. SPRT optimizes microclimate and minimizes effects on neighboring sites of noise, light, runoff, pollution, etc.

**Water Efficiency (Score 5)** SPiRiT minimizes the use of potable water for landscape irrigation and within the building.

**Energy and Atmosphere (Score 28)** SPiRiT ensures that buildings work as intended. It establishes energy efficiency and optimization for the base building and systems and encourages use of renewable and distributed energy systems. It reduces ozone depletion and supports early compliance with the Montreal Protocol.

**Materials and Resources (Score 13)** SPiRiT reduces waste from construction and building occupants and redirects recyclable material back to the manufacturing process. It extends the life cycle of existing building stock, in part by extending the life cycle of targeted building materials. It increases use of building products with recycled content material and of locally manufactured building products. It reduces depletion of finite raw materials and encourages environmentally responsible forest management.

**Indoor Environmental Quality (IEQ) (Score 17)** SPiRiT promotes indoor air quality (IAQ) and prevents exposure to Environmental Tobacco Smoke (ETS). It provides a high level of individual occupant control of thermal, ventilation, and lighting systems. SPiRiT provides a connection between indoor spaces and the outdoor environment through the introduction of sunlight and views into the occupied areas of the building. SPiRiT provides appropriate acoustic conditions for user privacy and comfort.

**Facility Delivery Process (Score 7)** SPiRiT delivers a facility that optimizes tradeoffs among sustainability, first costs, life cycle costs and mission requirements. It assures that the delivery process assures efficient operation and maintenance of the facility.

**Current Mission (Score 6)** SPiRiT assures that the delivery process establishes efficient operation and maintenance of the facility. It provides a high-quality, functional, healthy, and safe work environment to promote soldier and workforce productivity and retention.

**Future Missions (Score 4)** SPiRiT requires an understanding of: (1) The typical or likely lifespan of the function to be accommodated by the facility in order to recognize how soon the facility should be expected to adapt to a different use; and (2) The life spans of the building systems to understand when they will need to be updated during the lifespan of the facility and to design the facility in a manner that facilitates the updating of each system. It requires design of the facility to maximize accommodation of future uses. The greater the future flexibility, the less likely it is that the facility will become a source for waste materials, or that it will require additional materials.

SPiRiT Certification Levels

SPiRiT Bronze -- 25 to 34 Points
SPiRiT Silver -- 35 to 49 Points
SPiRiT Gold -- 50 to 74 Points
SPiRiT Platinum -- 75+ Points

SPRT is designed to be an easy-to-understand EXCEL worksheet that will allow self-scoring by building delivery teams and their members, either during the charrette process or by an independent panel.

Credit Equivalence: Under certain circumstances an action will be taken that will comply with the spirit, though not necessarily the letter, of the compliance criteria. Under these circumstances, the applicant must demonstrate that the actions taken are substantially similar in impact to the relevant criteria and request credit for those actions.

f. SPiRiT is the first edition of this program. The LEED Green Building Rating System criteria will be revised no later than every 3 years. It is intended that with the future edition of LEED 3.0 in 2003 all required applicable, equivalent military standards and regulations will be addressed availing us the use of LEED 3.0 upon release in order to design and build all future facilities according to sustainable principles.

13. Corps Of Engineers Green Building Criteria Update Program

In 1994, funding was provided for a 5-year program for the Corps to develop and update technical guidance and criteria for sustainable design and construction of Army facilities. The Corps continues this effort with steady stream funding programmed for FY00-05. The Corps has taken a comprehensive, ground-up approach to sustainable design technology in military construction. The Corps philosophy is to effect a fundamental and permanent change in the way all military projects are designed and constructed as opposed to a project-by-project basis. In order to institutionalize sustainable design into Corps design procedures, we are revising current construction guide specifications (CEGS) which are used to design and construct military projects. We have called this our Green Building Criteria Update Program (GBCUP). This provides a solid basis for incorporating a wide range of Green construction products and services into Corps projects, including:

- Floors, carpets, walls, doors, ceilings and roofing systems, including insulation and painting--Assessment of reusability, solid waste generation, and indoor air quality.
- Masonry, stucco, lathing and plastering--Environmental characteristics of recycled and composite materials.
- Metal studs in load-bearing walls as a substitute for wood.
- Scrap tire chips and cement and asphaltic concrete in pavements--Elimination and use of waste materials.
- Bottom ash used as fill, and waste materials in pavements--reusing construction waste materials.
- Recycled plastic composite railroad ties.
- Recycled site furnishings and playground equipment.
- Energy efficient HVAC controls, radiant heating systems and desiccant cooling systems.
- Water and energy conserving plumbing fixtures.

14. List of Sustainable Design and Green Building Organizations

a. Institute for Sustainable Design, University of Virginia, Charlottesville, Virginia, 22903.

b. Center for Sustainable Technology, Construction Research Center, Georgia Institute of Technology, 490 10th St NW, Atlanta, GA 30332-0519.

c. Centre for Sustainable Design, Faculty of Design, Surrey Institute of Art & Design, Falkner Road, Farnham, Surrey, GU9 7DS, United Kingdom.

d. Natural Resources Defense Council, 40 West 20th Street, New York, NY 10011.

e. U.S. Green Building Council, 90 Montgomery Street, Suite 1001, San Francisco, CA 94105.

f. Context Institute, PO Box 946, Langley, WA 98260.

g. Center of Excellence for Sustainable Development, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Denver Regional Support Office, 1617 Cole Boulevard, Golden, CO 80401.

h. Center for Environmental Design Research, 390 Wurster Hall, Berkeley, CA, 94720.

i. Green Building Information Council, Dr. Ray Cole, University of British Columbia, BC, Canada.

j. Design Center for Appropriate Technology, PO Box 41144 Tucson, Arizona 85717.

k. Energy Efficient Builders Association, 2950 Metro Drive, Suite 108, Minneapolis, MN, 55425.

l. Passive Solar Industries Council, 1511 K Street, NW, Suite 600, Washington DC, 20005.

m. Center for Building Science, Lawrence Berkeley National Laboratory, 1 Cyclotron Rd, Berkeley, CA 94720.

n. Sustainable Building Coalition, 3102 Breeze Terrace, Austin, TX, 78722.

o. Habitat for Humanity International, 121 Habitat Street, Americus, GA, 31709.

p. Alliance to Save Energy, 1200 18th Street, NW, Suite 900, Washington, DC, 20036.

q. American Council for an Energy-Efficient Economy, 1001 Connecticut Avenue, NW, Suite 801, Washington, D.C. 20036.

r. Geothermal Resources Council, PO Box 1350, 2001 Second Street, Suite 5, Davis, CA 95617-1350.

s. Ecology Action, 5798 Ridgewood Road, Willits, CA, 95490.

t. Rocky Mountain Institute, 1739 Snowmass Creek Road, Snowmass, Colorado 81654-9199.